

Transplantation Proposal for Plant Species of Conservation Importance (Rev.1)

North East New Territories (NENT) Landfill Extension | Contract No. EP/SP/77/15

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Formal Submission

Veolia Environmental Services Hong Kong Limited



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Client Information

Client	Veolia Environmental Services Hong Kong Limited
Client Address	40/F., One Taikoo Place, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong40/F., One Taikoo Place, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong
Client Contact	Mr. William Wan
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Project Team

Initials	Name	Role
CY	Colin Yung	Project Manager
FN	Fenelyn Nabuab	Ecologist/ ISA Certified Arborist HK1821A/TRAQ
JT	Jacky Tam	Ecologist/ ISA Certified Arborist/HK1963A
КЈВ	Kalvin Jay Boregon	Ecologist
SMR	Sheila Marie Rabi	GIS Specialist
JPT	Jhomar Tillo	Ecologist
RL	Ray Li	Environmental Consultant/ ISA Certified Arborist HK1838A/TRAQ





Meinhardt Infrastructure and

邁進基建環保工程顧問有限公司

33-35 Wong Chuk Hang Road

Environment Ltd

香港黃竹坑道33-35號

Tel 電話: +852 2858 0738 Fax 傳真: +852 2540 1580

mail@meinhardt.com.hk www.meinhardt-china.com www.meinhardtgroup.com

Hong Kong

創協坊10樓

Our Ref : Date:

CL/91823/0118-VFS 12 October 2022

By Email

Veolia Environmental Services Hong Kong Limited 40/F, One Taikoo Place 979 King's Road Quarry Bay Hong Kong

Attn.: Alvin Kam

Dear Sir

Re:

Contract No. EP/SP/77/15

North-East New Territories Landfill Extension (NENTX)

Transplantation Proposal for Plant Species of

Conservation Importance (Rev.1)

I refer to Conditions 2.7 and 2.9 under EP-292/2007 and Conditions 2.5 and 2.7 of Further Environmental Permit No. FEP-01/292/2007, regarding the submission of a methodology for transplantation. I hereby verified the captioned "Transplantation Proposal for Plant Species of Conservation Importance" dated 30 September 2022.

Yours faithfully

MEINHARDT INFRASTRUCTURE AND ENVIRONMENT LTD

Claudine Lee

Independent Environmental Checker

Aurecon Hong Kong Limited Unit 1608, 16/F, Tower B, Manulife Financial Centre, 223 – 231 Wai Yip Street, Kwun Tong Hong Kong T +852 3664 6888 F +852 3664 6999 E hongkong@aurecongroup.com w aurecongroup.com



Ref: P521530-0000-REV-NN-0012

By Email

7 October 2022

Meinhardt Infrastructure & Environment Ltd. 10/F Genesis 33-35 Wong Chuk Hand Road Hong Kong

Attn: Ms. Claudine Lee,

Dear Claudine,

Re: Contract No. EP/SP/77/15

Northeast New Territories Landfill Extension

Submission of Transplantation Proposal for Plant Species of Conservation Importance (Rev.1)

In accordance with the requirement specified in Conditions 2.7 and 2.9 of Environmental Permit No. EP-292/2007 and Conditions 2.5 and 2.7 of Further Environmental Permit No. FEP-01/292/2007, we are pleased to submit the certified "Transplantation Proposal for Plant Species of Conservation Importance (Rev.1)" dated on 30 September 2022 for your verification.

Should you require any further information or clarification, please do not hesitate to contact the undersigned or our Mr. Keith Chau on 3664 6788.

Yours faithfully, For and on behalf of Aurecon Hong Kong Limited

Fredrick Leong
Environmental Team Leader

Encl.

Transplantation Proposal for Plant Species of Conservation Importance (Rev.1)

CC.

- 1. IEC Ms. Claudine Lee (By email: claudinelee@meinhardt.com.hk)
- 2. IEC Representative Mr. Jimmy Lui (By email: jimmylui@meinhardt.com.hk)

Contents

Do	ocument Control	ii
Do	cument Information	ii
Clie	ent Information	ii
Do	ocument History	ii
Pro	oject Team	ii
Coı	ntents	iii
Apı	pendices	iv
Tak	bles in the Main Text	iv
Abl	breviations	iv
1.	Introduction	1
1.1	Background of the Project	1
1.2	Purpose of this Document	2
1.3	Structure of this Document	2
2.	Plant Species of Conservation Importance	2
2.2	Methodology	3
2.3	Findings	4
3.	Methodology	6
3.2	Personnel	6
3.3	Permit	6
3.4	Plant Species of Conservation Importance to be Transplanted	6
3.5	Receptor Site	7
3.6	Transplantation Works Procedures	8
4.	Post-transplantation Maintenance	11
4.2	Watering	11
4.3	Pruning, Weeding, and Pest Control	11
4.4	Fertilization	12
5.	Post-transplantation Monitoring and Audit	12
5.1	Monitoring and Audit	12
5.2	Reporting	12
6.	Implementation Programme	13
7.	References	14



Appendices

App	endix A Survey Area for the Vegetation Survey	1
App	endix B Plant Species of Conservation Importance	2
B.1	Location of Plant Species of Conservation Importance	3
B.2	Schedule of Plant Species of Conservation Importance	4
B.3	Photographic Records of dead AS-01 Incense Tree Aquilaria sinensis sapling during the Additional Surve	ey 7
B.4	Photographic Records of Plant Species of Conservation Importance Recommended for Transplantation	9
B.5	Photographic Records of Plant Species of Conservation Importance Recommended for Felling and Compensation	14
App	endix C Proposed Receptor Site	21
C.1	Location of the Proposed Receptor Site	22
C.2	General view of the receptor site, Upper Section of Ping Yuen River	23
C.3	Proposed Receptor Site for Lamb of Tartary	24
C.4	Proposed Receptor Site for Bottlebrush Orchids	24
Арр	endix D Sample Data Sheet for Post-Transplantation Monitoring	25
Tal	oles in the Main Text	
Table	e 2.1: Flora Species of Conservation Importance Recorded (AEIAR-111/2007)	2
to be	e 2.2: Ecological Characteristics and Protection Status of Plant Species of Conservation Importa e Impacted and Proposed Mitigation Measures	nce 5
	e 3.1: Summary of Measurements and Health conditions	6
rable	e 6.1: Summary of Implementation Programme	13

Abbreviations

AFCD	Agriculture, Fisheries and Conservation Department
EIA	Environmental Impact Assessment
EM&A	Environmental Monitoring and Audit
EPD	Environmental Protection Department
EP	Environmental Permit
ET	Environmental Team
FEP	Further Environmental Permit
GLTMSDB	Greening, Landscape and Tree Management Section Development Bureau
IEC	Independent Environmental Checker
NENTX	North East New Territories Landfill Extension
TPRP	Tree Preservation and Removal Proposal



1. Introduction

1.1 Background of the Project

- 1.1.1 The North East New Territories Landfill Extension (the NENTX Project) is a designated project. The Environmental Impact Assessment (EIA) Report was approved (AEIAR-111/2007) with conditions on 20 September 2007 and the Environmental Permit (EP) EP-292/2007 (the "EP) was issued on 26 November 2007. Moreover, a Further Environmental Permit FEP-01/292/2007 (the "FEP") was also issued under the EIA Ordinance on 28 April 2022.
- 1.1.2 In order to fulfil the Conditions 2.7 and 2.9 of the EP and Conditions 2.5 and 2.7 of the FEP regarding to the transplantation of plant species of conservation importance, detailed vegetation surveys shall be carried out with the purpose of providing details for the formulation and implementation of transplantation scheme for these plant species of conservation importance recorded within the NENTX Project area prior to the commencement of the NENTX Project.
- 1.1.3 Specifically, Condition 2.7 of the EP and Condition 2.5 of the FEP states that "The Permit Holder shall, no later than one month before the commencement of construction of the Project, submit to the Director for approval four hard copies and one electronic copy of a detailed vegetation survey covering the affected habitats located within the Project area for the purpose of updating, identifying and recording the location and number, health condition and suitability for transportation of the affected individual plant species in order to provide details for the transplantation scheme. The survey shall cover the four plant species of conservation importance including the *Aquilaria sinensis*, *Rhododendron simsii*, *Endospermum chinense*, and *Arundina graminifolia*. The detailed vegetation survey shall be prepared by a qualified botanist or ecologist and shall be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA Report."
- 1.1.4 To carry out the detailed vegetation survey and prepare the transplantation proposal in order to fulfil the above EP and FEP conditions, EPD have commissioned ERM-Hong Kong, Limited (ERM) to undertake the Provision of Consultancy Services for Study on Ecological Conditions and Corresponding Transplantation and Translocation for NENT Landfill Extension.
- 1.1.5 The NENTX Design-Build-Operate (DBO) Contractor (the Contractor), on behalf of EPD/LDG, will be responsible for carrying out the transplantation works afterwards. The Contractor will follow all requirements in the approved transplantation proposal after seeking EPD's approval. If there are any updates or changes in the transplantation proposal, the Contractor will resubmit a detailed methodology before the survey (and seek EPD/SAG's approval again) in accordance with Conditions 2.7 and 2.9 of the EP and Conditions 2.5 and 2.7 of the FEP.
- 1.1.6 The NENTX Design-Build-Operate (DBO) contract was awarded to Veolia Environmental Services Hong Kong Limited (Veolia).



1.1.7 Fugro Technical Services Limited (Fugro) has been appointed by Veolia to update/prepare the Transplantation Proposal for Plant Species of Conservation Importance and implement the transplantation works in accordance with the approved Transplantation Proposal.

1.2 **Purpose of this Document**

- 1.2.1 This Transplantation Proposal for Plant Species of Conservation Importance (the "Proposal") was prepared to present the transplantation scheme for the transplantation works of the identified plant species of conservation importance within the NENTX Project Site.
- 1.2.2 This Proposal is prepared by a qualified botanist/ecologist certified by the Environmental Team (ET) Leader and Independent Environmental Checker (IEC) in accordance with Condition 2.7 of the EP and Condition 2.5 of the FEP.

1.3 Structure of this Document

- 1.3.1 Succeeding this Section 1 Introduction, the remainder of this Proposal is presented as follows:
 - Section 2 summarizes the detailed vegetation survey;
 - Section 3 details the methodology of the transplantation activities;
 - Section 4 details the post-transplantation maintenance;
 - Section 5 details the post-transplantation monitoring and audit;
 - Section 6 details the implementation programme.

Plant Species of Conservation Importance 2

As aforementioned in Section 1.1.3, four plant species of conservation importance were 2.1.1 recorded in the approved EIA Report, AEIAR-111/2007. The details of these species of conservation importance are summarized in Table 2.1.

Table 2.1: Flora Species of Conservation Importance Recorded (AEIAR-111/2007)

Species	Chinese Name	Conservation/ Protection Status
Incense Tree Aquilaria sinensis	土沉香	Common in Hong Kong, protected under Cap. 586; listed in Illustrations of Rare & endangered plant in Guangdong Province (Wu & Hu, 1988) and Threatened Species List of China's Higher Plants (Vulnerable, endemic species) (Qin et al., 2017), status in China as "Near Threatened" (AFCD 2003), listed as "Vulnerable" in China Plant Red Data Book, under State protection (Category II) in China (AFCD 2003), listed in Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna), classified as "Vulnerable" on the IUCN Red List.
Endospermum Endospermum chinense	黄桐	Restricted (Xing et al., 2000)
Red Azalea Rhododendron simsii	紅杜鵑	Protected under Cap. 96A, but is very common in Hong Kong



Species	Chinese Name	Conservation/ Protection Status
Bamboo Orchid Arundina graminifolia	竹葉蘭	Protected under Cap. 96A and Cap. 586, listed in Appendix II of CITES

Notes:

Conservation and/or Protection Status:

- a. AFCD (2003): Rare and Precious Plants of Hong Kong (Online version). Agriculture, Fisheries and Conservation Department, HKSAR, Hong Kong.
- b. Cap. 96A: Forestry Regulations, the subsidiary legislation of Forests and Countryside Ordinance (Cap. 96).
- c. Cap. 586: Protection of Endangered Species of Animals and Plants Ordinance
- 2.1.2 A detailed vegetation survey was carried out in compliance with the requirements of Condition 2.7 of the EP and Condition 2.5 of the FEP to update, identify, and record the location and number, health condition, and suitability for transplantation of the affected individual plant species in order to provide details for the transplantation scheme.

2.2 Methodology

- 2.2.1 Prior to the actual vegetation survey, a preliminary site visit/survey was conducted in March 2021 to initially survey the transect routes and investigate the locations of previously recorded plant species of conservation importance. The actual detailed vegetation survey was conducted after consent of the survey efforts were sought from Government Representatives (including EPD and AFCD).
- 2.2.2 The detailed vegetation survey was conducted between the months of May and August 2021 by direct observation along the transect routes. During the surveys, special attention was given to the previously recorded plant species, i.e., Incense Tree, Red Azalea, Endospermum, and Bamboo Orchid) of conservation importance and their corresponding habitat types. Nonetheless, active search in the accessible areas of the NENTX Project site were also carried out to maximise the survey effort. The survey area for the detailed vegetation survey is shown in **Appendix A**. Moreover, any other plant species of conservation importance observed during the surveys were also recorded.
- 2.2.3 Representative photographs of each identified plant species of conservation importance were taken. Furthermore, the number of individuals of species of conservation importance, health condition and suitability for transplantation, as well as other useful information were noted. Each identified individual was tagged, and each tagged individual was assigned with a unique plant reference number.



2.2.4 Moreover, additional surveys were carried out by Fugro from May to August 2022 to locate the four plant species of conservation importance recorded during the detailed vegetation survey and the two remaining species that were recorded during the EIA but were not observed during the detailed vegetation survey.

2.3 Findings

- 2.3.1 A total of four plant species of conservation importance were identified within the NENTX Project Site, i.e., Incense Tree, Endospermum, Lamb of Tartary *Cibotium barometz*, and Bottlebrush Orchid *Goodyera procera*, during the vegetation surveys. The Red Azalea and Bamboo Orchid, which were previously recorded in the approved EIA within the NENTX Project Site, were not currently observed.
- 2.3.2 A total of six nos. of Incense Tree (three nos. of saplings and three nos. of trees), 23 nos. of Endospermum trees, one individual of Lamb of Tartary, and about 19 clusters of Bottlebrush Orchid will be directly impacted by the proposed construction of the NENTX Landfill.
- 2.3.3 As a mitigation measure, these plant species of conservation importance are proposed to be transplanted in suitable receptor sites except for the one sapling and three nos. of Incense trees; and 23 nos. of Endospermum trees. One sapling of Incense tree will not be transplanted nor compensated as it is observed dead during the additional survey (Appendix B.3). Meanwhile, the rest of the trees were not suitable for transplantation due to low survival rate after transplantation, potential difficulties in transportation (to receptor site) because of their large size, and difficulty in preparing rootball of sufficient size as they are currently growing on slopes. These trees are, instead, proposed to be compensated and the details of the compensatory planting will be presented in the Tree Preservation and Removal Proposal (TPRP). The approved TPRP will be submitted to EPD and AFCD for record.
- 2.3.4 **Table 2.2** summarises the number of plant species of conservation importance recorded within the NENTX Project Site and their proposed mitigation measure.
- 2.3.5 The locations of the plant species of conservation importance are shown in **Appendix B.1**, their detailed measurements, health conditions, and other information in **Appendix B.2**, and photographic records in **Appendix B.3**, **Appendix B.4** and **Appendix B.5**.



Table 2.2: Ecological Characteristics and Protection Status of Plant Species of Conservation Importance to be Impacted and Proposed Mitigation Measures

Species	Conservation/ Protection Status	No. of Individuals Recorded in the Project Site	Flowering Period/ Fruiting Period	Locations Recorded in Project Site	Proposed Mitigation Measures
Incense Tree Aquilaria sinensis 土沉香	Common in Hong Kong, protected under Cap. 586; listed in Illustrations of Rare & endangered plant in Guangdong Province (Wu & Hu, 1988) and Threatened Species List of China's Higher Plants (Vulnerable, endemic species) (Qin et al., 2017), status in China as "Near Threatened" (AFCD 2003), listed as "Vulnerable" in China Plant Red Data Book, under State protection (Category II) in China (AFCD 2003), listed in Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna), classified as "Vulnerable" on the IUCN Red List.	Three nos. of saplings AS-01 (dead), AS-02 and AS-03 Three nos. of trees AS-T1797, AS-T1112, AS-T1787	Mar – May/Sep – Oct	Dead sapling along access road; Saplings in the woodland along Tong To Ancient Trail north of the access road; and trees scattered in slope areas of the Project site	Two alive saplings to be transplanted to the receptor site Trees to be compensated under the TPRP
Lamb of Tartary Cibotium barometz 金毛狗	Protected under Cap. 586; status in China as "Vulnerable", under State protection (Category II) in China (AFCD 2003), listed under Appendix II of CITES	One individual CB-01	-	In the woodland along Shek Shui Ancient Trail south of the access road	Transplant to the receptor site
Endospermum Endospermum chinense 黃桐	Restricted (Xing et al., 2000)	23 nos. of trees EC-T0210, EC-T0306, EC-T0308, EC-T0348 EC-T0533, EC-T0798, EC-T0800, EC-T0902 EC-T1135, EC-T1173, EC-T1425, EC-T1445 EC-T1463, EC-T1747, EC-T1581, EC-T1731 EC-T1732, EC-T1735, EC-T1737, EC-T1738 EC-T1309, EC-T1741, EC-T1746	May – Aug/ Aug – Nov	Scattered in slope areas of the Project site	Compensate under the TPRP
Bottlebrush Orchid Goodyera procera 高斑葉蘭	Protected under Cap. 96 and Cap. 586, but very common in Hong Kong, listed under Appendix II of CITES	19 clusters GP-01 to GP-19	Mar – Apr	In a stream along Shek Shui Ancient Trail south of the access road	Transplant to the receptor site



3. Methodology

3.1.1 This section presents the methodology and approach of the transplantation works. The transplantation scheme presented in this section was formulated based on the information collected during the vegetation surveys.

3.2 Personnel

3.2.1 The actual transplantation works will be carried out by a landscape contractor and supervised by a qualified ecologist or botanist. The qualified ecologist or botanist should have at least five years of relevant experience in transplantation and/or vegetation survey and assessment. Moreover, accessible areas of NENTX Project site will be checked again prior to transplantation and the check results will be mentioned on the Transplantation Report.

3.3 Permit

3.3.1 Prior to the commencement of the transplantation works, relevant permit(s) under Cap. 96 Forests and Countryside Ordinance and Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance will be obtained from AFCD. The application should provide at the least brief information of the Project, the proposed transplantation works, and the location maps indicating the collection sites and the receptor sites.

3.4 Plant Species of Conservation Importance to be Transplanted

- 3.4.1 Based on the findings of the detailed vegetation survey and verification survey, three plant species of conservation importance are considered suitable for transplantation, i.e., two nos. of Incense Tree saplings in the woodland along Tong To Ancient Trail north of the access road, one cluster of Lamb of Tartary in the woodland along Shek Shui Ancient Trail south of the access road, and about 19 clusters of Bottlebrush Orchid in a stream along Shek Shui Ancient Trail south of the access road. Some recent photographic records of the plant species of conservation importance to be transplanted is shown in **Appendix B.4**.
- 3.4.2 The summary of measurements and health conditions of the plant species of conservation importance proposed for transplantation are shown in **Table 3.1**.

Table 3.1: Summary of Measurements and Health conditions

Reference no.	Species	DBH (mm)	Height (cm)	Spread (m)	Health
AS-02	Incense Tree	15	170	1.0	Good
AS-03	Aquilaria sinensis 土沉香	n.a.	130	0.8	Good
CB-01	Lamb of Tartary Cibotium barometz 金毛狗	n.a.	100	1.5	Good
¹ GP-01 to GP-19	Bottlebrush Orchid Goodyera procera	n.a.	10 - 30	n.a	Good



Reference no.	Species	DBH (mm)	Height (cm)	Spread (m)	Health	
	高斑葉蘭					
Note: 1. One of cluster of Bottlebrush Orchid may be composed of one ind. up to 12 individuals.						

3.5 Receptor Site

3.5.1 Selection of the Receptor Site

- 3.5.1.1 The three plant species of conservation importance will be transplanted to suitable receptor sites. To further safeguard these species, the receptor site is recommended to be within the facilities managed by the Contractor or remote area(s) located away from human disturbances. However, it is also crucial to consider the similarity in site conditions between the collection site and receptor site and the accessibility of the receptor for future maintenance and monitoring.
- 3.5.1.2 The two nos. of Incense Tree saplings are proposed to be transplanted to the landscaping area(s) adjacent to the future office site of the NENTX Landfill. The exact location(s) will be confirmed in the Master Landscape Plan of the NENTX Landfill.
- 3.5.1.3 The individual of Lamb of Tartary and clusters of Bottlebrush Orchid are proposed to be transplanted in the Upper Section of Ping Yuen River outside but proximate to the NENTX Project Site. This section of the Ping Yuen River is a natural shady stream with rocky substrate and moderately flowing water surrounded by woodland habitat. Vegetation communities were observed thriving in the riparian zone and in the earth pockets of the rocky substrate (Appendix C). The upper section of the riparian zone of this receptor site will provide the shaded and moist environment for Lamb of Tartary and the earth pockets between rocks in its stream bed for Bottlebrush Orchid. Furthermore, as the proposed receptor site is about 50 m in length, which is longer than the collection site (about 30 m in length), constraint on its capacity to receive all the transplanted orchids is not anticipated. Lastly, the accessibility and proximity of this receptor site may reduce plant stress during transport and allow immediate transplantation; and ensures effective maintenance and monitoring of the transplanted species without difficulties and delay.

3.5.2 Preparation of the Receptor Site

3.5.2.1 Minimal site clearance and preparation are needed before the actual transplantation works. Rubbish, litter, and all deleterious material will be removed from the surface of the ground and from the soil for planting; and overgrown weeds will be removed manually. The receptor site will also be checked for the presence of other plant species of conservation importance to ensure that no such species will be affected during transplantation works.



3.5.2.2 Planting pits will be excavated onsite after the determination of the actual sizes of the root balls of the transplant. Any large stones, i.e., stones exceeding 25mm in diameter, found in the planting pit should be removed. Compacted soil around the planting pit should be loosened with a spade to facilitate air penetration.

3.6 Transplantation Works Procedures

- 3.6.1 Saplings of Incense Tree, Lamb of Tartary, and Bottlebrush Orchids have delicate underground root systems associated with localised soil microbes, particularly specialized fungal community in the root systems of orchids. Hence, it is crucial that transplanting of these individuals should be conducted with root mass and soil intact, as much as possible, and planting them immediately to the receptor site after the collection process. Immediate transplanting can reduce potential damage to the root systems and to the interaction between the soil microbes and the plant specimens during the transplant; and can maximise the proportion of the root systems maintained intact in the root ball after the transplantation.
- 3.6.2 Collection and transplantation should be completed within a minimal duration in order to minimise exposure time and subsequent mortality due to transplantation shock or disease. It is required to transplant the individuals/clusters to their receptor sites within the same day of collection and preferably in the morning or on a cloudy day to avoid subjecting the plants to direct sunlight on later time of the day.
- 3.6.3 All equipment, i.e., sharp spade and knife, that will be used in transplantation works should be sterilized before transplantation and after preparing each root ball of the individuals/clusters. This is to minimise any contamination of the soil mass and roots and spread of disease from one root ball to another through the equipment. The equipment should be sterilized with diluted bleach solution and rinsed thoroughly afterwards.

Incense Tree Saplings

- 3.6.3.1 The recommended root ball to diameter ratio is 10:1 (GLTMSDB, 2014) with depth of 12 inches for Incense Tree saplings. However, the actual root ball dimensions and practicality of root ball preparation will be adjusted in accordance with the actual site condition which is to be determined by the qualified ecologist or botanist.
- 3.6.3.2 Once the rootball have been prepared and dug to the desired depth, the root ball will be shaped with sharp spade or knife or similar sharp implement to prevent breaking the root ball. Root ball cuts should be clean to avoid tearing or breaking the roots. All cut roots should be trimmed cleanly back to the healthy tissues to reduce the split and torn roots. Root ends should be cut sharply to promote a flush of new fibrous roots, helping the individuals recover faster from injuries (GLTMSDB, 2014). The full circumference of root balls will be then wrapped with damp hessian to maintain moisture during the transplantation process. The burlapped root balls will be then transplanted into the prepared planting pits/locations immediately.



- 3.6.3.3 The root balls will be planted by following the same orientation and soil gradient of their original locations, as far as practicable. Root ball supporting material such as the damp hessian will be removed from the root ball prior to final back filling. The back-fill soil will be reinstated and settled in layered sections to limit future settling and prevent air pockets. It will not be compacted to a density that inhibits root growth; however, it will be tamped firmly around the base to stabilise the individual, but the rest of the soil should be tamped only lightly or left to settle on its own. Water will be added to the root ball and the backfill to bring the root ball to field capacity and when finally set, the top surface of the root ball will not be below the surrounding soil (GLTMSDB, 2014). No fertilizer will be added in the planting pits or on the root ball surface to avoid chemical burning of the roots by the fertilizers. However, mulch, if necessary, will be placed around the individuals to retain moisture.
- 3.6.3.4 As the receptor site for the Incense Tree sapling is within the NENTX Project Site, temporary construction netting, or other appropriate eye-catching netting will be set up around the receptor site to demarcate the works exclusion zone throughout the construction period of the Project. Moreover, shading nets will be established to provide a semi-shady environment for the transplanted saplings at least for the first three months to avoid direct exposure of the saplings to direct sunlight. Duration of the provision of shading nets will be adjusted during the post-transplantation monitoring and maintenance period.

Lamb of Tartary

- 3.6.3.5 Wherever possible, the root ball will be prepared with sufficient root ball depth of about 12 inches. However, the actual root ball dimensions and practicality of root ball preparation will be adjusted in accordance with the actual site condition which is to be determined by the qualified ecologist or botanist. Once the rootball have been prepared and dug to the desired depth, same procedures for root ball preparation and transplantation in the receptor site as detailed in Sections 3.6.3.2 and 3.6.3.3 of this Proposal will be followed.
- 3.6.3.6 In order to avoid human disturbances, provision of eye-catching netting to demarcate works exclusion zone is not necessary. But for easy recognition of the transplanted plants during post-transplantation maintenance and monitoring period, a numbered tag made of waterproof and durable material will be placed on each individual/clusters. The tags will be maintained throughout the post-transplantation maintenance and monitoring period.

Bottlebrush Orchid

3.6.3.7 As mentioned in **Table 3.1 of this Proposal**, Bottlebrush Orchids are growing in cluster with one up to 12 individual per cluster. The individuals growing close together will be transplanted in the same root ball so as to keep the root mass intact, as much as possible, and minimise potential damage to the underground root systems. Wherever possible, all of the root balls will be prepared with sufficient root ball depth of about 6 inches. However, the actual root ball dimensions and practicality of root ball preparation will be adjusted in accordance with the actual site condition which is to be determined by the qualified ecologist or botanist.



- 3.6.3.8 It should be noted that many individuals/clusters of Bottlebrush Orchid were observed to grow on rocks in streambed with small earth pockets. These individuals/clusters with most of their lateral roots and root hairs exposed on the substrate surface, will be removed by modified bareroot. After digging the trench (if any), the soil on the lateral roots will be partially washed-off with water to minimize injury during removal from the substrate. However, to provide some protection to the rest of the root system and help them recover more rapidly, they will be prepared "semi-bare" such that significant amount of soil shall be left clinging to the roots. Soil substrate removal from the roots shall only be minimally done and as far as practicable.
- 3.6.3.9 Any tap root or anchor root that still holds at a depth beyond 12 inches will be cut off. To lift each individual cluster out of the trench, each will be grasped at the base of its stem, close to the substrate. The root collar of each plant will be marked before transplanting to ensure subsequent planting at an appropriate depth at the receptor site such that the finish level will be 1 inch below the marked collar level to allow plant settlement. The roots will be kept moist by wrapping it in plastic or wet paper (Shaughnessy et al., 1999).
- 3.6.3.10 As far as practicable, each cluster/individual will be inserted to the planting pit with 50% wider width than its root system such that its roots can be fully expanded and arranged in their natural position. It should be ensured that roots will neither be in crowded and twisted orientation; nor arranged in a circle against the wall of the hole or all in one direction as roots improperly arranged at planting can result in slow growth or even the death of the individuals after a few years. To prevent unnecessary settling of the plant, the center portion of the bottom area of the planting pit will be elevated higher than the edges. The mound height shall be determined by placing the plant on the mound so that the pre-marked portion of the root collar is an inch above the soil line of the planting pit (GLTMSDB, 2014). While holding each individual at the center of the pit, the subsoil will be added while fingers are gently working among the roots and firming the soil to eliminate air pockets. Then, the topsoil will be added and be lightly tamped upon (Shaughnessy et al., 1999). Wires or other means of supporting system may be necessary to temporarily fix the orchids to the nearby large stones before their root system develops that will enable them to withstand water flow.
- 3.6.3.11 In order to avoid human disturbances, provision of eye-catching netting to demarcate works exclusion zone is not necessary. But for easy recognition of the transplanted plants during post-transplantation maintenance and monitoring period, a numbered tag made of waterproof and durable material will be placed on each individual/ clusters. The tags will be maintained throughout the post-transplantation maintenance and monitoring period.



4. Post-transplantation Maintenance

4.1.1 All transplanted individuals will be maintained by the Contractor for 12 months (establishment period) after planting to the receptor sites.

4.2 Watering

- 4.2.1 The transplanted Incense Tree saplings and Lamb of Tartary should be watered daily at least for the first week post-transplantation. The watering frequency will be gradually reduced to 2-3 times per week throughout the post-transplantation maintenance period. Watering frequency during the wet season shall be adjusted according to weather conditions and instruction from the qualified ecologist or botanist.
- 4.2.2 Fresh water should be used for watering. Water should be applied using a rose or a sprinkler and in such a manner that compaction, washout of soil and loosening of plants will not arise. Direct watering onto the leaves and excessive watering in soaking the specimens in water should be avoided.
- 4.2.3 For the Bottlebrush Orchid, since they will be transplanted to wet areas near or in the stream bed of the receptor site, watering can be conducted less frequently and according to the site conditions and instruction from the qualified ecologist or botanist. However, the orchids should be checked for their health condition in the same frequency as that for the transplanted Incense Trees and Lamb of Tartary.

4.3 Pruning, Weeding, and Pest Control

- 4.3.1 Regular weeding and pest control should be implemented during the post-transplantation maintenance period. Any unwanted weeds (such as *Mikania micrantha*) found in the receptor sites should be removed by the Contractor once identified or when instructed by the qualified ecologist or botanist. Manual weeding should be conducted to prevent accidental damage to the transplanted individuals.
- 4.3.2 The Contractor should regularly check for any insect attack or fungal infestation during the regular maintenance and monitoring events. Application of chemicals as pest control should be avoided, as far as practicable. Minor infestations found on the transplanted specimens should be removed manually or with soapy water.
- 4.3.3 Pruning may be carried out, if necessary, after transplantation to remove any broken or insect/fungal infested stems of the transplanted individuals.
- 4.3.4 All weeds and rubbish resulting from the weeding and other maintenance activities should be disposed of properly by the Contractor.



4.4 **Fertilization**

4.4.1 The need of fertilization will be determined by the qualified ecologist or botanist considering the latest growth performance of the transplanted individuals. For the Bottlebrush Orchid, if fertilization is considered necessary, it is preferred to use orchid fertiliser as the standard fertiliser for horticultural use may burn the roots of the orchids.

Post-transplantation Monitoring and Audit 5.

5.1 **Monitoring and Audit**

- 5.1.1 As per Section 10.3 and Table 10.1 of the EM&A Manual, the survival and growth of the transplanted species will be monitored by a qualified ecologist or botanist at least twice a month during the first three months after transplantation and once a month in the following nine months. The need for any further monitoring will be reviewed and determined according to the monitoring results of the 12-month monitoring.
- 5.1.2 The monitoring parameters will include but are not limited to health condition, survival, and growth performance of each of the transplanted individuals/clusters. Photographic records of the transplanted individuals will be undertaken for each monitoring event.
- 5.1.3 Moreover, during construction, operation, restoration and aftercare phases, routine site inspection will be conducted on a weekly basis to audit the mitigation measures on disturbance on habitat adjacent to the work areas. Monitoring of transplantation will be audited as part of the site audit programme.
- 5.1.4 The monitoring of the compensated individuals of Aquilaria sinensis and Endospermum chinense will be over the 10-year period under the ecological monitoring of compensatory woodland. Detailed monitoring requirements will be presented in the approved TPRP. The approved TPRP will be submitted to EPD and AFCD for record.

5.2 Reporting

- 5.2.1 A Detailed Transplantation Report will be prepared after the completion of transplantation works. The report will include the details of the transplantation works such as but not limited to an updated description of the physical environment of the receptor site, number, health conditions, and photos of the transplanted species.
- 5.2.2 Monitoring results of each monitoring event will be reported to the Contractor on a monthly basis throughout the post-transplantation monitoring period for a period of 12 months. Monthly Reports will include the following information.
 - Date(s) of monitoring and maintenance of the reporting month;
 - Key findings of the post-transplantation monitoring, including but not limited to photographic records of the transplanted plants of conservation importance in the receptor site(s) and conditions of the transplanted plants (see Appendix D) for the sample data sheet;



- Recommendation on post-transplantation maintenance; and
- Key maintenance activities conducted in the reporting month.
- 5.2.3 A Final Monitoring Report summarising the monitoring results throughout the posttransplantation maintenance and monitoring period will be prepared to evaluate the success of the transplantation works.
- 5.2.4 The Detailed Transplantation Report; and monthly and final post-transplantation monitoring reports will be submitted to EPD and AFCD for deposit.

Implementation Programme 6.

- 6.1.1 As per Condition 2.9 of the EP and Condition 2.7 of the FEP, "the transplantation shall be carried out according to the transplantation scheme approved under Condition 2.7 of the EP and Condition 2.5 of the FEP before commencement of construction of the Project. Moreover, since most plants use more energy to sustain their flowers and fruits during flowering/fruiting period, transplanting of Incense Trees, Lamb of Tartary and Bottlebrush Orchids should be conducted in either spring or a period when the plants are not in bloom (if applicable). Hence, the transplantation works are proposed to be carried out in late wet season or early dry season, i.e., late October to early November, which is also outside the peak of flowering period of the Incense Tree and Bottlebrush Orchid. Conducting the transplantation works outside their flowering period can reduce transplantation shock of the transplanted individuals.
- 6.1.2 The post-transplantation maintenance and monitoring will commence immediately after the transplantation works and will be undertaken before the site clearance in the collection sites.
- 6.1.3 The summary of the Implementation Programme is shown in **Table 6.1**.

Table 6.1: Summary of Implementation Programme

Monitoring Parameter	Frequency and Duration		
Survey of plant species of the conservation importance within the Project Site	Between the months of May and August 2021		
Additional surveys	May to August 2022		
Transplantation works	Late wet season or early dry season, i.e., late October to early November		
Monitoring of survival and growth of transplanted	At least twice a month during the first three months after transplantation and once a month in the following nine months.		
species	The need for any further monitoring will be reviewed and determined according to the monitoring results of the 12-month monitoring.		
Monitoring of compensated individuals of Endospermum	Details will be included in the TPRP.		



7. References

- Environmental Protection Department. 2007. Environmental Monitoring and Audit Manual for the North East New Territories (NENT) Landfill Extension Feasibility Study. Prepared by Ove and Arup Hong Kong Limited for the Environmental Protection Department.
- Environmental Protection Department. 2007. Environmental Impact Assessment Report for the North East New Territories (NENT) Landfill Extension Feasibility Study. Prepared by Ove and Arup Hong Kong Limited for the Environmental Protection Department.
- Environmental Protection Department. 2022. Detailed Vegetation Surveys and Transplantation Proposal (V2). Provision of Consultancy Services for Study on Ecological Conditions and Corresponding Transplantation and Translocation for NENT Landfill Extension. Prepared by ERM-Hong Kong Limited for Environmental Protection Department.
- Greening, Landscape and Tree Management Section Development Bureau (GLTMSDB). 2014. Guidelines on Tree Transplanting. https://www.greening.gov.hk/filemanager/content/pdf/tree_care/Guidelines_on_Tree_Transplanting_e.pdf. Accessed on 24 October 2020.
- Shaughnessy, D., B. Polomski and T. Fernandez. 1999. Transplanting established trees and shrubs. https://hgic.clemson.edu/factsheet/transplanting-established-trees-shrubs/.

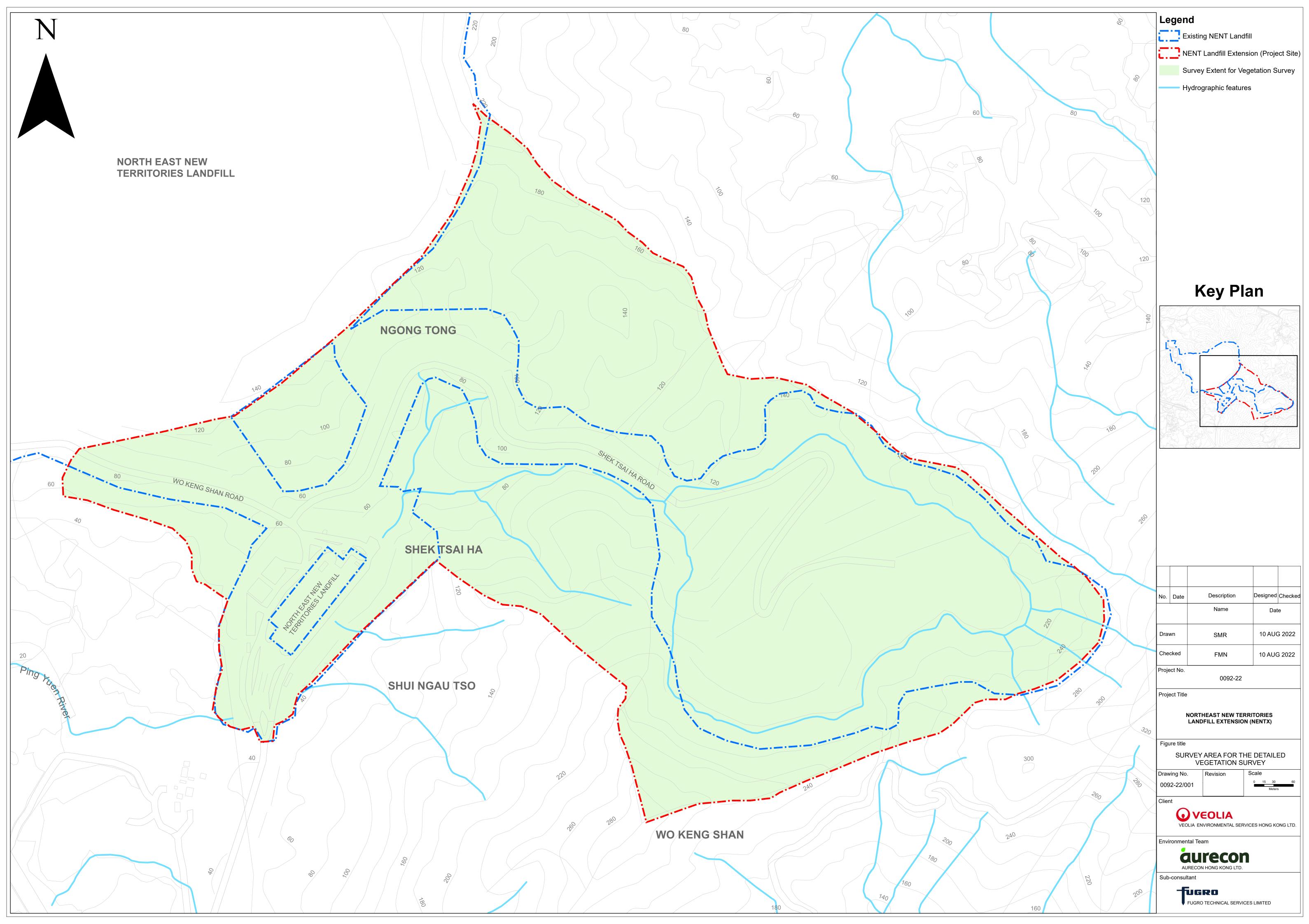
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Appendix A

Survey Area for the Vegetation Survey





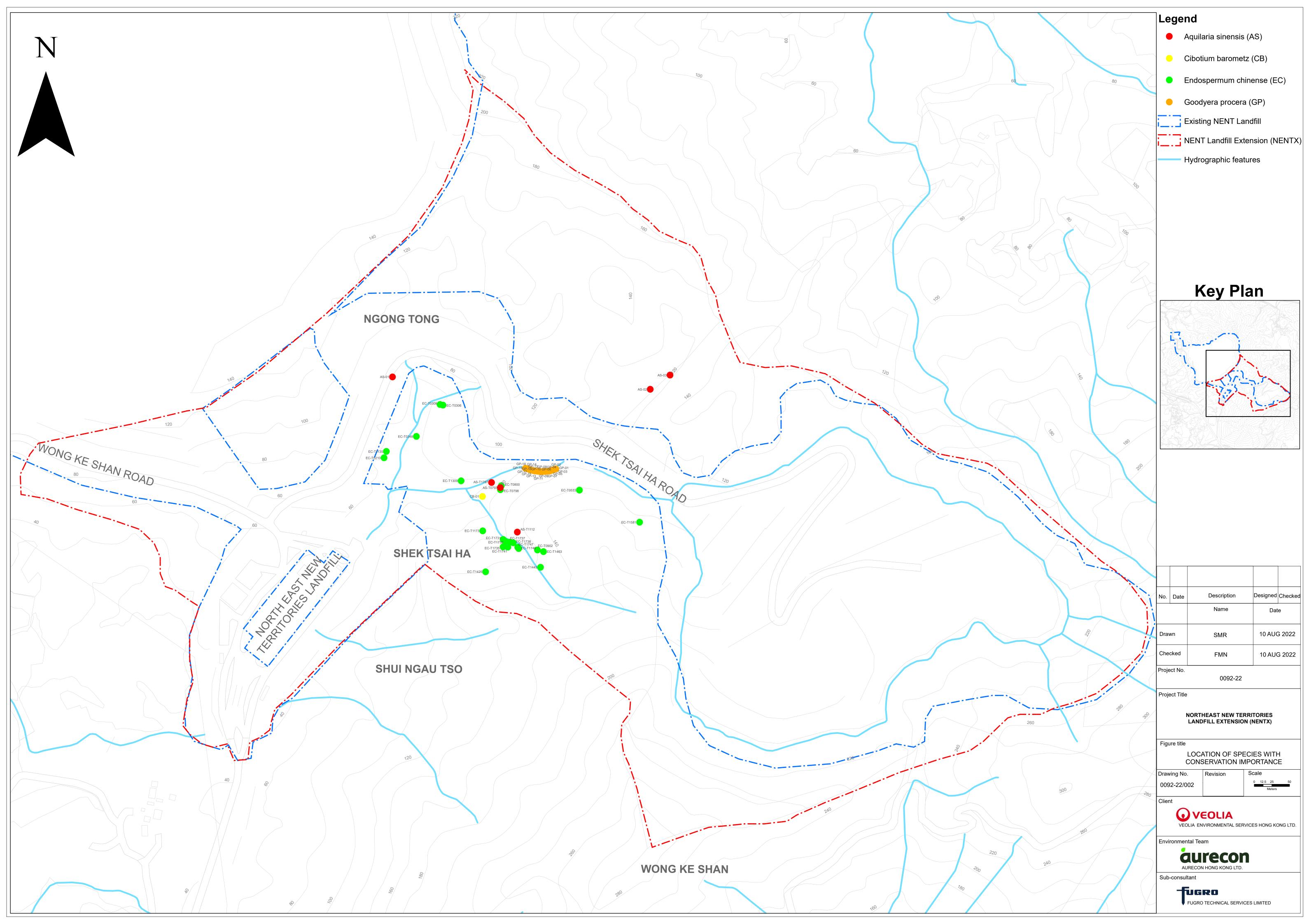
Appendix B

Plant Species of Conservation Importance



B.1 Location of Plant Species of Conservation Importance





B.2 Schedule of Plant Species of Conservation Importance

Reference No.	Species	DBH (mm)	Height (cm)	Spread (m)	Health	Suitability for transplanting	Justification
AS-01	Aquilaria sinensis (dead)	15	170	-	Poor	N	dead sapling
AS-02	Aquilaria sinensis	-	120	0.6	Good	Υ	nil
AS-03	Aquilaria sinensis	-	130	0.8	Good	Υ	nil
AS-T1797	Aquilaria sinensis	9.5	200	3.5	Average	N	low survival rate after
AS-T1112	Aquilaria sinensis	9	120	3	Average	N	transplantation, potential difficulties in transportation to
AS-T1787	Aquilaria sinensis	11	205	3	Average	N	receptor site because of their large size, and difficulty in preparing rootball of sufficient size as they are currently growing on slopes
GP-01	Goodyera procera	-	30	-	Good	Υ	nil
GP-02	Goodyera procera	-	20	-	Good	Υ	nil
GP-03	Goodyera procera	-	30	-	Good	Υ	nil
GP-04	Goodyera procera	-	20	-	Good	Υ	nil
GP-05	Goodyera procera	-	20	-	Good	Υ	nil
GP-06	Goodyera procera	-	10	-	Good	Υ	nil
GP-07	Goodyera procera	-	10	-	Good	Υ	nil
GP-08	Goodyera procera	-	10	-	Good	Υ	nil
GP-09	Goodyera procera	-	10	-	Good	Υ	nil
GP-10	Goodyera procera	-	20	-	Good	Υ	nil
GP-11	Goodyera procera	-	20	-	Good	Υ	nil
GP-12	Goodyera procera	-	10	-	Good	Υ	nil
GP-13	Goodyera procera	-	10	-	Good	Υ	nil
GP-14	Goodyera procera	-	20	-	Good	Υ	nil



Reference No.	Species	DBH (mm)	Height (cm)	Spread (m)	Health	Suitability for transplanting	Justification
GP-15	Goodyera procera	-	20	-	Good	Υ	nil
GP-16	Goodyera procera	-	30	-	Good	Υ	nil
GP-17	Goodyera procera	-	20	-	Good	Υ	nil
GP-18	Goodyera procera	-	20	-	Good	Υ	nil
GP-19	Goodyera procera	-	20	-	Good	Υ	nil
CB-01	Cibotium barometz	-	100	1.5	Good	Υ	nil
EC-T0210	Endospermum chinense	240	12	5	Average	N	low survival rate after
EC-T0306	Endospermum chinense	210	13	5	Average	N	transplantation, potential difficulties in transportation to receptor site because of their large size, and difficulty in preparing rootball of sufficient size as they are currently growing on slopes
EC-T0308	Endospermum chinense	120	10	4	Average	N	
EC-T0348	Endospermum chinense	290	11	8	Average	N	
EC-T0533	Endospermum chinense	230	8.2	4.5	Average	N	
EC-T0798	Endospermum chinense	200	9	4	Average	N	
EC-T0800	Endospermum chinense	117	6.2	3.5	Average	N	
EC-T0902	Endospermum chinense	720	16	7	Average	N	
EC-T1135	Endospermum chinense	160	8	4.5	Average	N	
EC-T1173	Endospermum chinense	200	10	4.5	Average	N	
EC-T1309	Endospermum chinense	120	8	4	Average	N	
EC-T1425	Endospermum chinense	240	9	4	Average	N	
EC-T1445	Endospermum chinense	160	12	4	Average	N	
EC-T1463	Endospermum chinense	250	11	5	Average	N	
EC-T1581	Endospermum chinense	100	9	3.5	Average	N	
EC-T1731	Endospermum chinense	180	8	4	Average	N	
EC-T1732	Endospermum chinense	455	15	8	Average	N	
EC-T1735	Endospermum chinense	360	14	6.5	Average	N	



Reference No.	Species	DBH (mm)	Height (cm)	Spread (m)	Health	Suitability for transplanting	Justification
EC-T1737	Endospermum chinense	205	3	9	Average	N	
EC-T1738	Endospermum chinense	140	10	4	Average	N	
EC-T1741	Endospermum chinense	300	12	5	Average	N	
EC-T1746	Endospermum chinense	350	14	7	Average	N	
EC-T1747	Endospermum chinense	270	12	4	Average	N	



B.3 Photographic Records of dead AS-01 Incense Tree *Aquilaria sinensis* sapling during the Additional Survey



General view



Rotten root





Dead branches



Dead trunk



B.4 Photographic Records of Plant Species of Conservation Importance Recommended for Transplantation

B.4.1 AS-02 Sapling of Incense Tree Aquilaria sinensis, 25 May 2022









B.4.2 AS-03 Sapling of Incense Tree Aquilaria sinensis, 25 May 2022







B.4.3 CB-01 Lamb of Tartary *Cibotium barometz*, 15 June 2022





B.4.4 Some Clusters of Bottlebrush Orchid *Goodyera procera*, 25 May 2022













B.5 Photographic Records of Plant Species of Conservation Importance Recommended for Felling and Compensation



EC-T0210 Whole View *Endospermum chinense* Fell



EC-T0306 Whole View *Endospermum chinense* Fell



EC-T0308 Whole View *Endospermum chinense* Fell

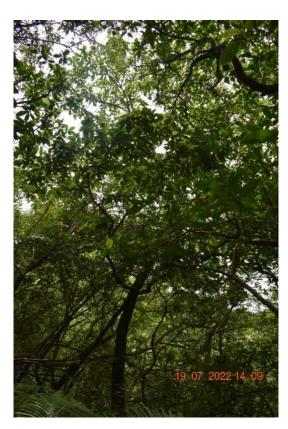


EC-T0348 Whole View *Endospermum chinense* Fell





EC-T0533 Whole View *Endospermum chinense* Fell



EC-T0798 Whole View *Endospermum chinense* Fell



EC-T0800 Whole View *Endospermum chinense* Fell



EC-T0902 Whole View *Endospermum chinense* Fell





EC-T1135 Whole View *Endospermum chinense* Fell



EC-T1173 Whole View Endospermum chinense Fell



EC-T1425 Whole View *Endospermum chinense* Fell



EC-T1445 Whole View *Endospermum chinense* Fell





EC-T1463 Whole View *Endospermum chinense* Fell



EC-T1581 Whole View *Endospermum chinense* Fell



EC-T1731 Whole View *Endospermum chinense* Fell



EC-T1732 Whole View *Endospermum chinense* Fell





EC-T1735 Whole View *Endospermum chinense* Fell



EC-T1737 Whole View *Endospermum chinense* Fell



EC-T1738 Whole View *Endospermum chinense* Fell



EC-T1741 Whole View *Endospermum chinense* Fell





EC-T1746 Whole View *Endospermum chinense* Fell



EC-T1747 Whole View *Endospermum chinense* Fell



AS-T1787 Whole View Aquilaria sinensis Fell



AS-T0797 Whole View Aquilaria sinensis Fell





AS-T1112 Whole View Aquilaria sinensis Fell



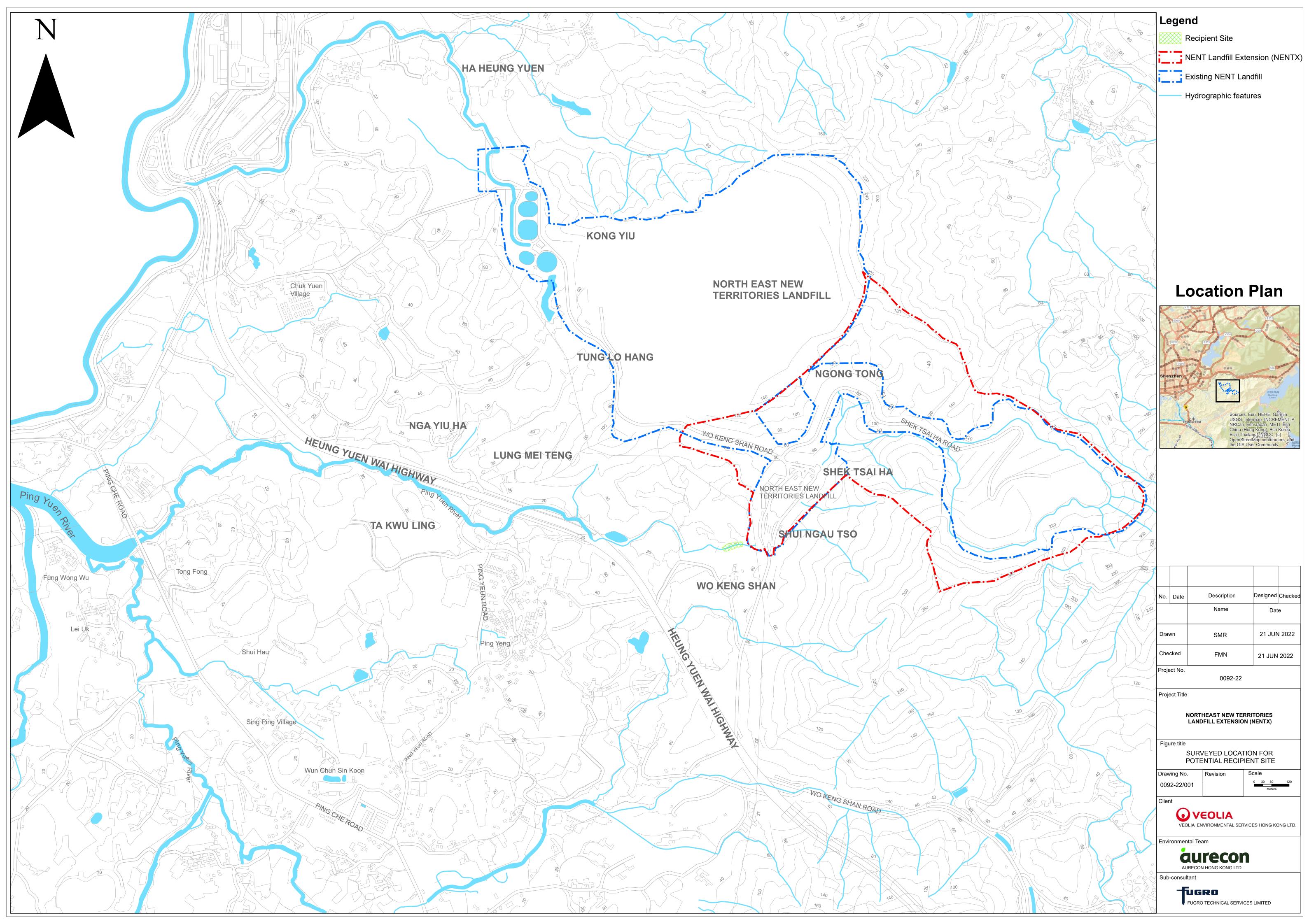
Appendix C

Proposed Receptor Site



C.1 Location of the Proposed Receptor Site





C.2 General view of the receptor site, Upper Section of Ping Yuen River







C.3 Proposed Receptor Site for Lamb of Tartary



C.4 Proposed Receptor Site for Bottlebrush Orchids





Appendix D

Sample Data Sheet for Post-Transplantation Monitoring



Post-Transplantation Monitoring Conditions of Transplanted Plants at Receptor Sites

		1.01
Date of Submission:	Surveyor:	
Date of Submission:		

Date of	Receptor Site	No.	Species DBH (mr	ı	Plant Size Measurements		Amenity Value Form	Health Condition St	Structural Condition	Recommendation on	Key Maintenance	Remark	
Monitoring and Maintenance				DBH (mm)	Crown Spread (m)	Height (m)	(High/ Medium/ Low)	(Good/ Fair/ Poor)	(Good/ Fair/ Poor)	(Good/ Fair/ Poor)	Post-Transplantation Activities Maintenance Conducted	Activities Conducted	

Note

1. Measurements of spread and DBH are not applicable for undersized tree, shrubs, herbs and ferns.